CASIO
V-T500/V-N500 Series
Hardware Manual

(Version 1.07)

CASIO Computer Co., Ltd.

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1. Introduction

1.1 Feature

Platform

- Android 4.0

Communication capabilities

- Built-in wireless LAN module (conforming to IEEE802.11a, IEEE802.11b, IEEE802.11g, and IEEE802.11n)
- Bluetooth® Version 4.0 (Class2)
- USB version 1.1 (Host/Client)
- NFC

Dimensions and weight

- Outer dimensions : Approx. 210(W) × 14.4(D) ×190(H) mm
- Weight : 780 g

Shock resistance and splash-proof

- Drop resistance : 1.0 m

CPU and memory capacity

- CPU OMAP 1.5GHz Dual Core
- Memory capacity RAM : 1GB
  FROM : 16GB

1.2 Model Configuration

Table 1.1 Model configuration

Model Number	WWAN	System Case	Remarks
V-T500-E	-	-	
V-T500-GE	GSM / W-CDMA	-	
V-N500-E	-	Yes	
V-N500-EF	-	-	
V-N500-GEF	GSM / W-CDMA	-	

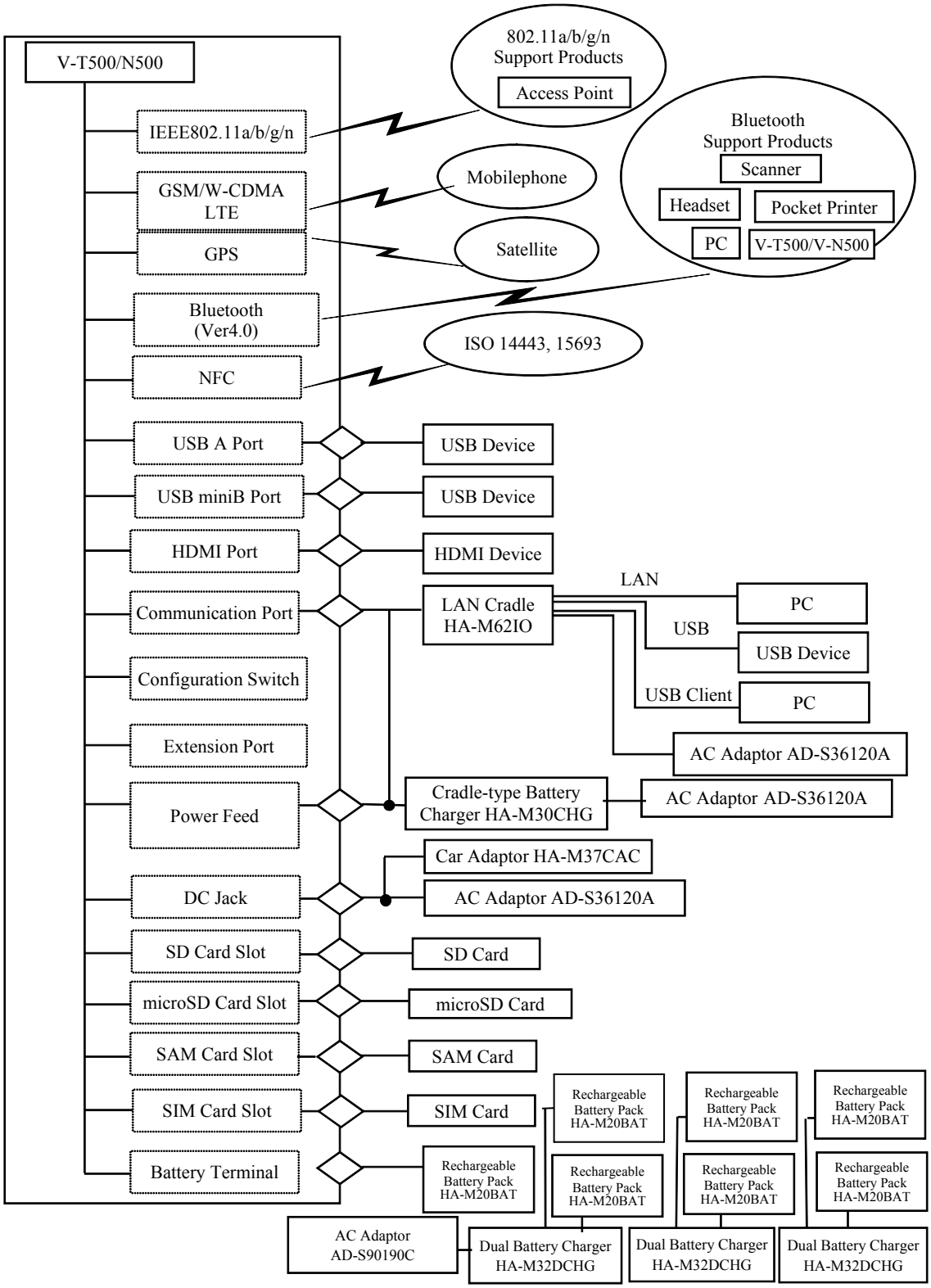
Table 1.2 Option List

Model Number	Description	Remarks
HA-M62IO	LAN/USB Cradle	
HA-M30CHG	Cradle-type Battery Charger	
HA-M32DCHG	Dual Battery Charger	
AD-S36120A-N	AC Adaptor (Cradle, The Terminal)	
AD-S90190C-N5	AC Adaptor (Dual Battery Charger)	
HA-M20BAT	Rechargeable Battery Pack	
AC-CORD-EU	AC Power Cord (Cradle, The Terminal)	for Europe
AC-CORD-US		for North America
AC-CORD-TW		for Taiwan
AC-CORD-KR		for Korea
AC-CORD-AU		for Australia
AC-CORD2-EU	AC Power Cord (Dual Battery Charger)	for Europe
AC-CORD2-US		for North America
AC-CORD2-TW		for Taiwan
AC-CORD2-KR		for Korea
AC-CORD2-AU		for Australia
HA-M37CAC	In-vehicle Adaptor	
HA-M96PEN	Digitizer Pen	
HA-M95HB	Hand Belt	
HA-M98DC	Screen Cover	
HA-M97ST	Neck Strap	
HA-M99CAS	System Case	

Table 1.3 Accessories

Item	V-T500-E V-T500-GE	V-N500-EF V-N500-GEF	V-N500-E
AC Adaptor	Yes	Yes	Yes
AC Power Cord	Yes	Yes	Yes
Rechargeable Battery Pack	Yes	Yes	Yes
Rechargeable Battery	Yes	Yes	Yes
System Case	-	-	Yes
Paper Holder (for B5 size)	-	Yes	Yes
Paper Holder (for A5 size)	-	Yes	Yes
microSD Eject Jig	Yes	Yes	Yes
Printed Matter of WEEE	Yes	Yes	Yes
Printed Matter of Rechargeable Battery	Yes	Yes	Yes

1.3 Interface Configuration



* Interface configuration varies depending on model number.

Figure 1.1

1.4 External Views

1.4.1 V-T500/V-N500

The following illustrations show external views of the terminal.

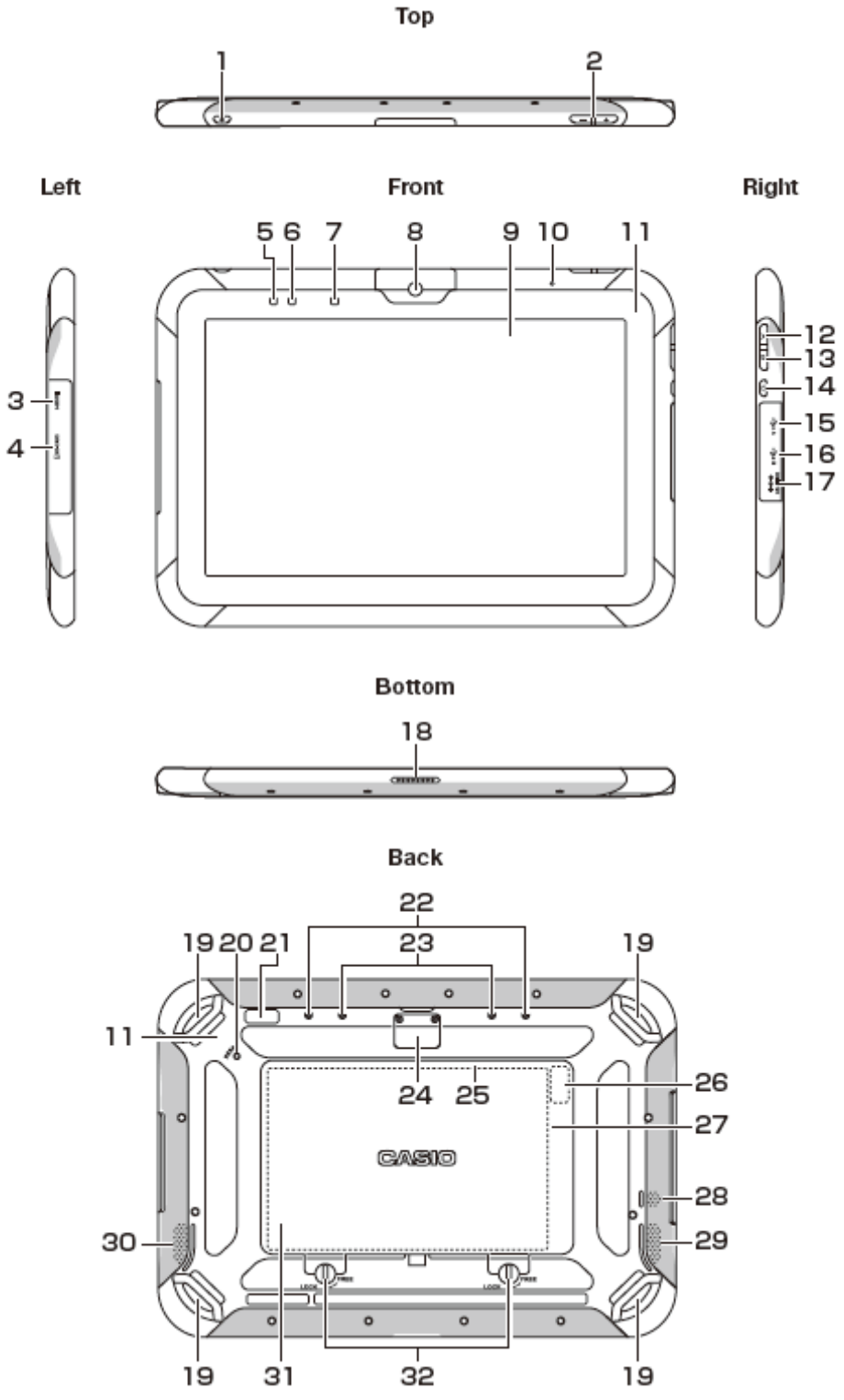


Figure 1.2

Table 1.4 Name and function of each part

No.	Name	Description
1	Power Key	Key to turn on and off of the power of the terminal.
2	Sound Volume Key	To control of sound volume.
3	HDM Connector	For connection with external MIDI equipment.
4	SD Card Slot	Slot for SD card
5	Recharge Indicator LED	Lit up with Orange: Under recharge. Blinking with Orange: Battery power is 0% to 5%. Lit up with Green: Recharge completed. Lit up with Red: Abnormal battery pack or out of rechargeable temperature range. Also lit up Green for about 1 second when power turn to ON..
6	Notice Indicator LED	LED to activate applications.
7	Illuminance Sensor	Automatically adjusts the back light brightness depending on the ambient luminosity.
8	Inner Camera	For capturing images and shooting pictures.
9	Display (Touch Panel)	Operatable by finger touch and allows text input or screen handling by optional pen-type digitizer.
10	Microphone	For input of voice.
11	NFC Reading Part	Card data is read by shading this part with card.
12	Button, Function A	Button to activate applications.
13	Button, Function B	Button to activate applications.
14	Screen Lock Button	Pushing this button allow to lock or unlock the screen.
15	USB A Port	To connect the terminal with external USB equipment.
16	USB miniB Port	To connect the terminal with external USB equipment.
17	DC Jack	To connect the terminal AC Adaptor or In-vehicle adaptor.
18	Charge/Communication Terminal	To change battery in the terminal put on the cradle, and use for USB/LAN communication.
19	Mount	To attach system case, hand belt and neck strap.
20	Reset Switch	The terminal is reset by push of this switch.
21	Outer Camera	For capturing images and shooting pictures.
22	Catch for Screen Cover	To attach screen cover.
23	Catch for Pen Holder	To attach pen holder of pen-type digitizer.
24	Extension Slot	Provided for extension of system.
25	SAM Card Slot	To insert SAM card. (removal of rechargeable battery pack is required.)
26	SIM Card Slot	To insert SIM card. (removal of rechargeable battery pack is required.)
27	Configuration Switch	To configure start-up conditions of the terminal, system administrator use only. Users shall refrain from touching this switch.
28	microSD Card Slot	To insert microSD card. (removal of rechargeable battery pack is required.)
29	Buzzer	For generation of beeping buzzer.
30	Speaker (L)	For sound output.
31	Speaker (R)	For sound output.
32	Rechargeable Battery Pack Cover	Rechargeable battery pack to be installed inside the cover.
33	Rechargeable Battery Pack Cover Lock Switch	For open/close of rechargeable battery pack cover by rotating this part.

1.4.2 System Case

The following illustrations show external views of System Case.

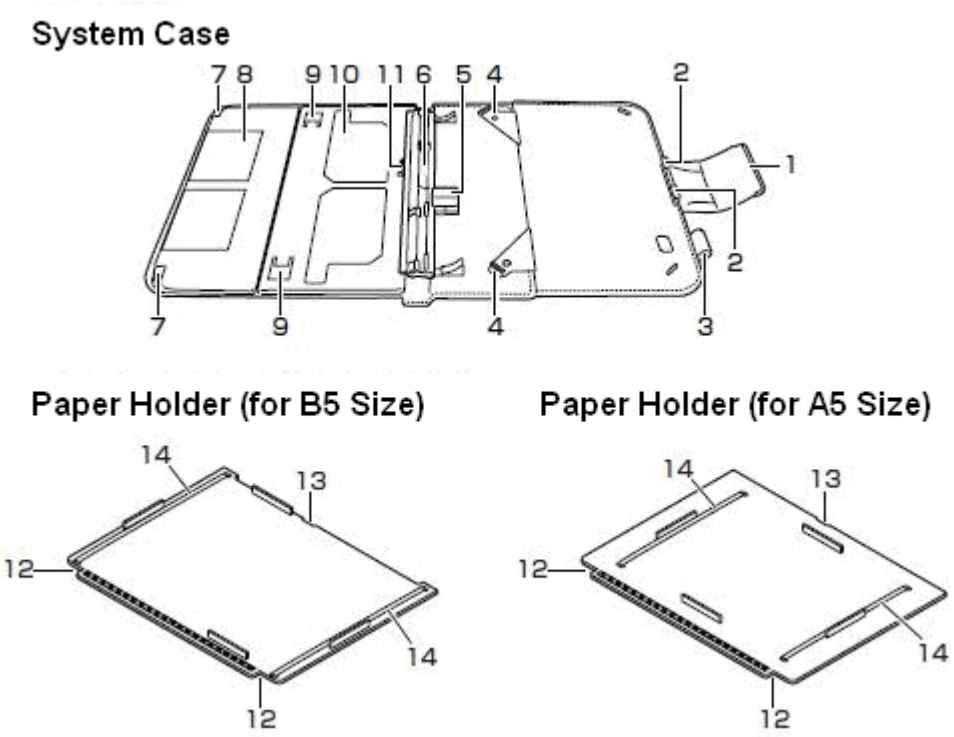


Figure 1.3

Table 1.5 Name of each part

No.	Name	No.	Name
1	Fastener	8	Business Card Read Area
2	Unit Holder (Upper)	9	Stopper for Flip'n Shoot
3	Pen Holder	10	Business Card Holder
4	Unit Holder (Lower)	11	Paper Holder Fixture (Lower)
5	Magnetic Sensor	12	Notch (Upper)
6	Pen-type Digitizer Holder	13	Notch (Lower)
7	Paper Holder Fixture (Upper)	14	Paper Holding Belt

1.4.3 LAN/USB Cradle, HA-M62IO

The following illustrations show the external views of LAN/USB Cradle, HA-M62IO.

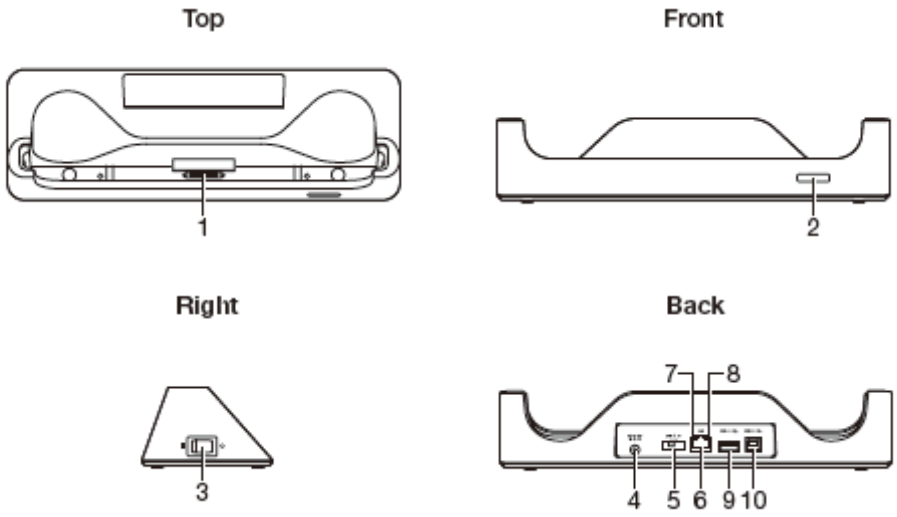


Figure 1.4

Table 1.6 Name and function of each part

No.	Name	Description
1	Power Supply and Communication Terminals	Terminals for power supply and data communication use.
2	Power Indicator LED	Indicates status of power supply and normal/abnormal installation of the terminal. Lit up with Red: Power is on. The terminal is not installed. Lit up with Green: Power is on. The terminal is correctly installed. Light-out: Power is off.
3	Power Switch	Switch to turn ON/OFF the power.
4	AC Adaptor Jack	Jack to connect output of optional AC Adaptor to supply power.
5	Selection Switch	Switch to select USB host, USB Client, or LAN. To use host, switch to A side, and switch to B side for client.
6	LAN Port	Port to connect LAN cable to enable connection with PC or HUB to transfer (down/up loading) system data, file data.
7	LAN Communication Status Indicator LED	Indicates operational status of LAN. Light-out: Communication is not being executed. Blinking: Communication is being executed.
8	LAN Connection Status Indicator LED	Indicates LAN connection status. Light-out: LAN cable connection is abnormal. Lit up with Orange: LAN cable connectionism abnormal.
9	Port for USB Host	To connect supported USB peripheral device.
10	Port for USB Client	Port to connect USB cable to enable connection with PC or HUB to transfer (down/up loading) system data, file data. Installation of exclusive driver software in PC, prior to use, is required.

1.4.4 Cradle-type Battery Charger, HA-M30CHG

The following illustrations show the external views of Cradle-type Battery Charger, HA-M30CHG.

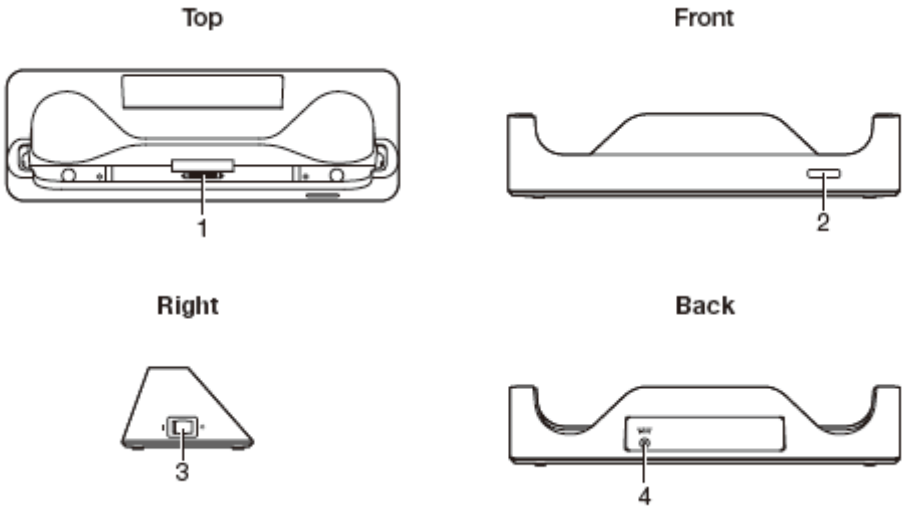


Figure 1.5

Table 1.7 Name and function of each part

No.	Name	Description
1	Power Supply Terminals	Terminals for power supply.
2	Power Indicator LED	Indicates status of power supply and normal/abnormal installation of the terminal. Lit up with Red: Power is on. The terminal is not installed. Lit up with Green: Power is on. The terminal is correctly installed.
3	Power Switch	Switch to turn on/off the power of the terminal.
4	AC Adaptor Jack	Jack to connect output of optional AC Adaptor to supply power.

1.4.5 Dual Battery Charger, HA-M32DCHG

The following illustrations show the external views of Dual Battery Charger, HA-M32DCHG.

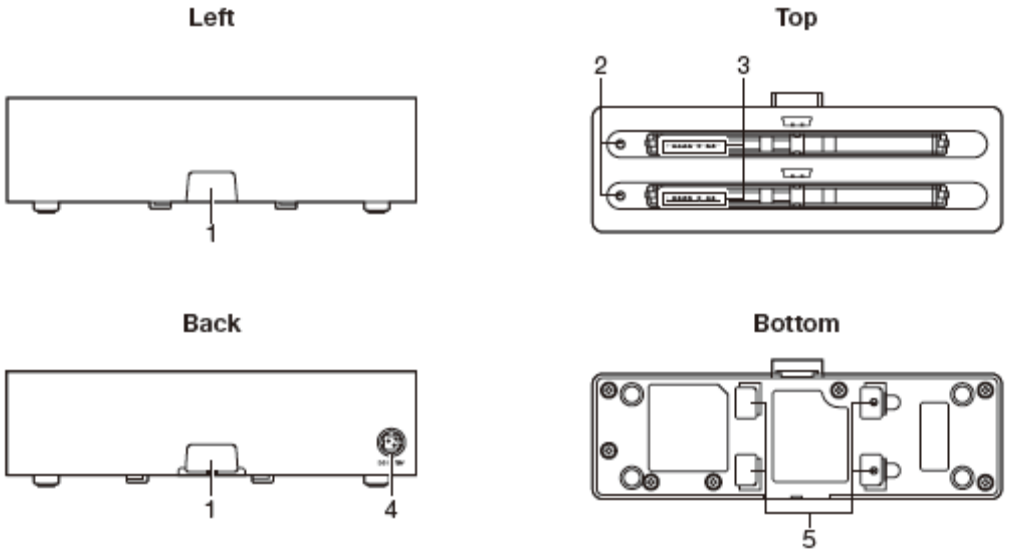


Figure 1.6

Table 1.8 Name and function of each part

No.	Name	Description
1	Dual Battery Charger Jack	For cable to connect another Dual Battery Charger.
2	Recharge Status Indicator LED	Indicates status of recharging Rechargeable Battery Pack.. Lit up with Green: Charging complete. Lit up with Red: Battery pack problem or standby due to the surrounding temperature being beyond the specified temperature range (Approximately 0°C to 40°C) (charging resumes when the temperature reaches the range.) Lit up with Orange: Charging Light-out: Not charging
3	Battery Power Supply Terminal	Terminal to connect Rechargeable Battery Pack..
4	AC Adaptor Jack	Jack to connect output of optional AC Adaptor to supply power.
5	Mounting Part for attachment to connect additional Dual Battery Charger.	To connect 2 or more Dual Battery Chargers, fix attachment to these parts.

1.4.6 In-vehicle Adaptor, HA-M37CAC

The following illustration shows the external view of In-vehicle Adaptor, HA-M37CAC.

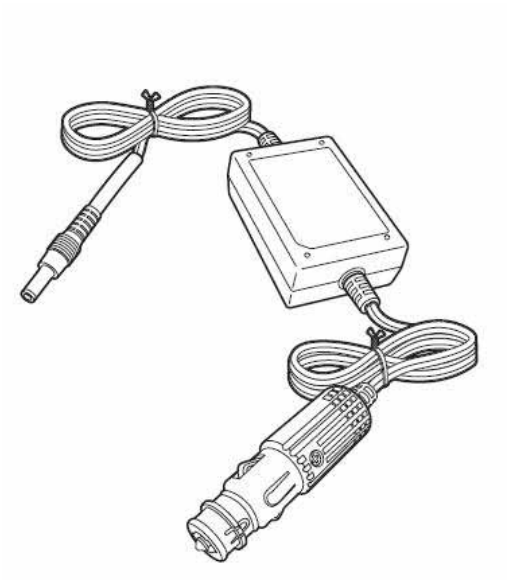


Figure 1.7

1.4.7 Rechargeable Battery Pack, HA-M20BAT

The following illustration shows the external view of Rechargeable Battery Pack, HA-M20BAT.

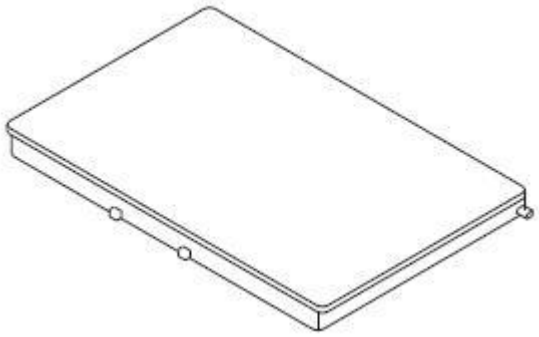


Figure 1.8

1.4.8 AC Adaptor, AD-S90190C-N5

The following illustration shows the external view of the AC Adaptor, AD-S90190C-N5.

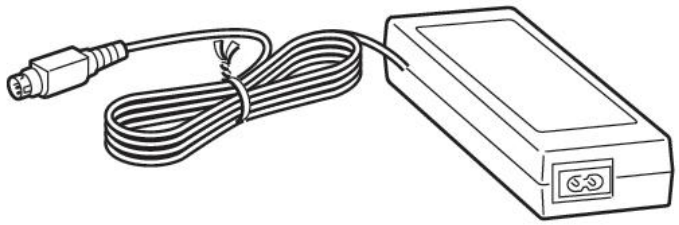


Figure 1.9

1.4.9 AC Adaptor, AD-S36120A-N

The following illustration shows the external view of the AC Adaptor, AD-S36120A-N.

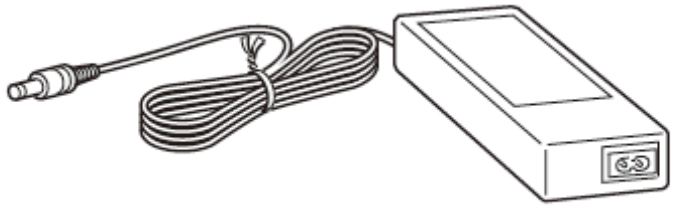


Figure 1.10

1.4.10 Digitizer Pen, AD-S36120A-N

The following illustration shows the external view of Digitizer Pen, HA-M96PEN.

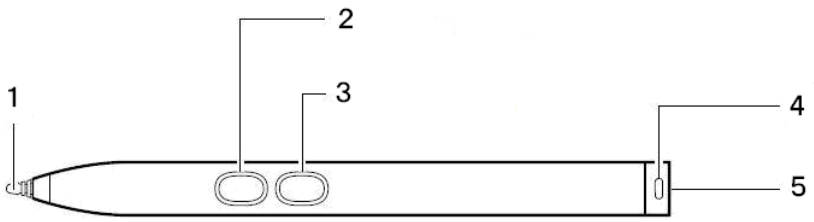


Figure 1.11

Table 1.9 Name and function of each part

No.	Name	Description
1	Pen Nibs	For touch display.
2	Quick Button 1	Button which can use by applications. (It is not set up in the initial state.)
3	Quick Button 2	Button which can use by applications. (It is not set up in the initial state.)
4	Strap Hole	To attach the strap including in a package.
5	Cap	To install/remove a dry cell by open/close this part.

1.4.11 Hand Belt, HA-M95HB

The following illustration shows the external view of Hand Belt, HA-M95HB.

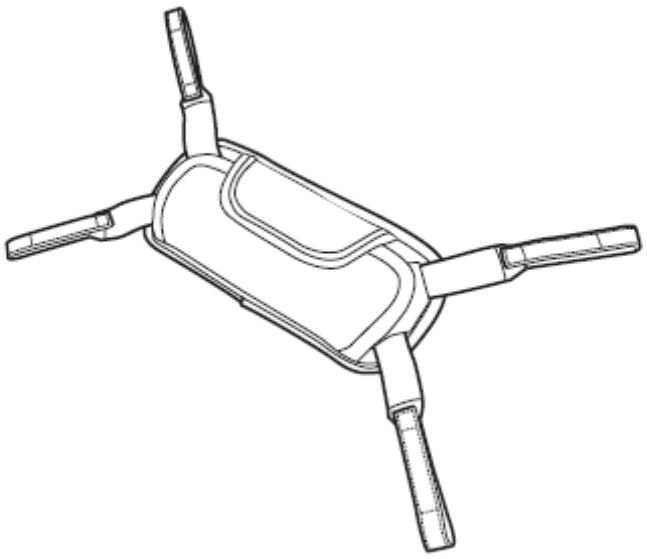


Figure 1.12

1.4.12 Screen Cover, HA-M98DC

The following illustration shows the external view of Screen Cover, HA-M98DC.

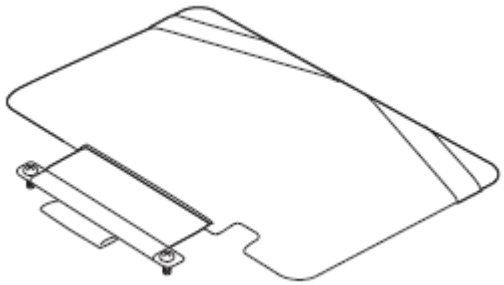


Figure 1.13

1.4.13 Neck Strap, HA-M97ST

The following illustration shows the external view of Neck Strap, HA-M97ST.

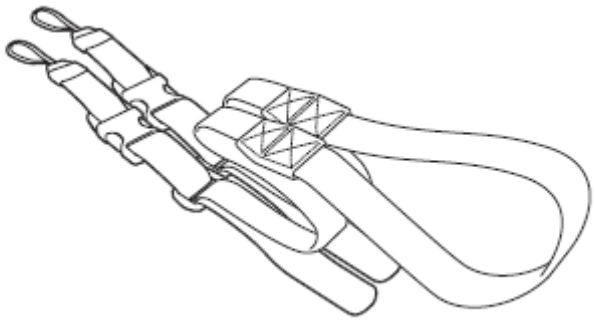


Figure 1.14

2. Basic Specifications

2.1 V-T500/V-N500

The basic specifications of V-T-500/V-N500 series (all models) are shown below.

Table 2.1

Item		Specifications	Remarks
CPU		OMAP 1.5GHz Dual Core	
Platform		Android 4.0	
Memory		RAM: 1GB FROM: 16GB	
Display			
	Method	ISP method TFT Color LCD	
	Screen Size	10.1 inch	
	Number of Dots	Horizontal: 1280 dots × Vertical: 800 dots (VGA)	
	Dot Pitch	Horizontal: 0.16957mm × Vertical: 0.1695mm	
	Graduation	16.7 M	
	Back Light	LED Back light	
	Viewing Angle	80°	Contrast: 10 or more
Touch Panel		Capacitive touch panel with Multi-Touch Input: Pen-type digitizer.	
Indicators			
	LED	1 × 2-color, 1 × 3-color LED	
Input			
	Keys and Buttons	Power, Functions A & B, Sound Volume, and Screen Lock.	
Bluetooth Communication, Class2			
	Standard	Bluetooth^{R} Specification Ver.4.0	
	Communication System	Spread Spectrum Communication System	
	Spread Modulation	FHSS: Frequency Hopping Spread Spectrum Method	
	Modulation Method	GFSK (1Mbps), Π/4-dqpsk(2Mbps), 8-DPSK (3Mbps) Low energy mode: GFSK only	
	Radio Wave Mode	F1D, G1D Low energy mode: FID only	
	Frequency	2.400GHz to 2.4835GHz	
	Communication Range	Approx. 5 meters	Varies depending on conditions of radio wave and environment.

Continue

	Number of Channels	79	
	Channel Separation	1MHz	
	Channel Band Width	1MHz (2MHz for Low Frequency)	
	Out put	4dBm Max. (Power Class 2)	
WLAN 802.11a/b/g/n			
	Standard	IEEE 802.11a/b/g/n	
	Communication System	Spread Spectrum Communication System	
	Spread Modulation	802.11a/g/n: OFDM (Orthogonal Frequency Division Multiplexing) 802.11b: DSSS (Direct Sequence Spread Spectrum)	
	Modulation Method	BPSK, QPSK, CCK, 16QAM, 64QAM	
	Radio Wave Mode	802.11a/n: D1D,G1D 802.11b/g: G1D	
	Frequency	<Center frequency> IEEE802.11a/n W52:36/40/44/48ch (5.18GHz to5.24GHz) W53:52/56/60/64ch (5.26GHz to 5.32GHz) W56:100/104/108/112/116/120/124/128/132 /136/140ch (5.50GHz to 5.70GHz) IEEE802.11b ch.1 to ch.14 (2.412GHz to 2.484Ghz) IEEE802.11g/n ch.1 to ch.13 (2.412GHz to 2.472Ghz) <Frequency range> IEEE802.11a/n 5.15GHz to 5.35GHz (W52, W53) 5.47GHz to 5.725GHz (W56) IEEE802.11b 2.400GHz to 2.497GHz IEEE802.11g/n 2.400GHz to 2.4835GHz	
	Transfer Rate	802.11a/g: up to 54Mbps 802.11b: up to 11Mbps 802.11n: up to 72Mbps	
	Communication Range	802.11b/g/n: 50m (in-door), 150 m (out-door) (2.4GHz band for /n) 802.11a/n: 30m (in-door), 150 m (out-door) (5GHz band for /n)	Varies depending on operating environmentand transfer rate.
	Number of Channels	802.11a/n: W52:4,W53:4,W56:11 (n:5GHz band) 802.11b: 14 802.11g/n: 13 (n:2.4GHz band)	

Continue

	Channel Separation	802.11a/n: 20MHz 802.11b/g/n: 5MHz	
	Channel Band Width	802.11a/b/g/n: 20MHz	
	Out put	802.11a: 12.0dBm Min. Typical 13.5dBm (at 54Mbps) 802.11b: 17.0dBm Min. Typical 18dBm (at 11Mbps) 802.11g: 12.0dBm Min. Typical 14dBm (at 54Mbps) 802.11n: 11.0dBm Min. Typical 12.5dBm (at 72Mbps)	
	Other Function	Roaming between multiple numbers of access points.	by Access Point
GSM			
	Standard	3GPP release99	
	Communication functionality	Packet data	
	Data transfer	Downlink: 236.8kbps Uplink: 236.8kbps	
	Modulation Method	GSM/GPRS/EDGE	
	Radio Wave Mode	GSM850: - 248KGXW (GPRS), 248KG7W (EDGE) GSM900: - 248KGXW (GPRS), 248KG7W (EDGE) GSM1800: - 248KGXW (GPRS), 248KG7W (EDGE) GSM1900: - 248KGXW (GPRS), 248KG7W (EDGE)	
	Frequency range	GSM850: - Uplink: 824 - 849MHz - Downlink: 869 - 894MHz EGSM900: - Uplink: 880 - 915MHz - Downlink: 925 - 960MHz DCS1800: - Uplink: 1710 - 1785MHz - Downlink: 1805 - 1880MHz PCS1900: - Uplink: 1850 - 1910MHz - Downlink: 1930 - 1990MHz	
	No. of Channels	GSM850: 124 EGSM900: 174 DCS1800: 374 PCS1900: 299	

Continue

	Channel spacing	GSM850: 45MHz EGSM900: 45MHz DCS1800: 95MHz PCS1900: 80MHz	
	Channel band width	GSM850: 25×2 MHz EGSM900: 35×2 MHz DCS1800: 75×2 MHz PCS1900: 60×2 MHz	
	Output power	33dBm (850/900MHz bands) 30dBm (1800/1900MHz bands)	
W-CDMA			
	Standard	UMTS/W-CDMA:3GPP release99 HSDPA:3GPP release5	
	Communication functionality	Packet data	
	Data transfer	Downlink: 14.4Mbps Uplink: 5.76Mbps	
	Modulation Method	UMTS/HSDPA/HSUPA	
	Radio Wave Mode	Band I: 4M19F9W Band V: 4M19F9W Band VI: 4M19F9W Band VIII: 4M15F9W	
	Frequency range	Band I: - Uplink: 1920 - 1980MHz - Downlink: 2110 - 2170MHz Band V - Uplink: 824 - 849MHz - Downlink: 869 - 894MHz Band VI - Uplink: 830 - 840MHz - Downlink: 875 - 885MHz Band VIII - Uplink: 880 - 915MHz - Downlink: 925 - 965MHz	
	No. of Channels	Band I: 277 Band V: 108 Band VI: 29 Band VIII: 152	
	Channel spacing	Band I: 190MHz Band V: 45MHz Band VI: 45MHz Band VIII: 45MHz	
	Channel band width	Band I: 60×2 MHz Band V: 25×2 MHz Band VI: 10×2 MHz Band VIII: 35×2 MHz	
	Output power	24dBm	

Continue

GPS					
	General Specifications	16-channel receiver, L1 1575.42MHz, C/A code			
	Positioning Method	Standalone-GPS (S-GPS)			
	Sensitivity	Acquisition sensitivity: -146dBm			
		Tracking Sensitivity: -162dBm			
SIM					
	Standard	ISO 7816 IC Card Standard			
	General Specifications	SIM Card with 3V, 1.8V is supported.			
NFC					
	Carrier Frequency	13.56MHz ±7kHz			
	Antenna	Magnetic loop antenna			
	Operating Magnetic Field	Output magnetic field intensity at contact to case. 1.5A/m or more			Measurement method: ISO10373-6 (JIS X 6305-6)
		Output magnetic field intensity at 50mm from case. 0.15A/m or more.			Measurement method: ISO18047-3 (JIS X 6305-6)
	Bit Rate	ISO14443 Type A: 106kbps ISO14443 Type B: 106kbps Felica: 212kbps,424kbps ISO15693: 1.65kbps			
	Modulation Method	ASK			
	Modulation Factor	10% modulation, 100% modulation			
	Readout Distance	ISO14443 Type A/B, FeliCa: 0mm (Contact to back face of Card)			Refer to Figure 1.2 for reading position.
		ISO15693: 0mm to 40mm Max. 0mm (Contact to back face of Card)			For reading position, refer to Figure 1.2. Varies depending on design of tag antenna.
	Readout Distance (Reference)	ISO15693 (Size: 85×54 mm): 40mm (for rear side)			
		ISO15693 (Size: 4mm^{Ø}): 2mm			
	Readout area	15mm×15mm (Depends on types of card/tag)			
	Communication Protocol	Standard	Support	Types of IC card performance verified	
		ISO14443 Type A	Yes	MIFARE Standard/ MIFARE Ultralight	
		ISO14443 Type B	Yes	JICSAP	
		FeliCa (JIS X 6319)	Yes	FeliCa Standard	

Continue

		ISO15693	Yes	I-CODE SLI /I-CODE SLI-S /I-CODE SLI-L /my-d V 10 plain /my-d Light /Tag-it plus (See note1) /Tag-it pro /Tag-it standard	When data is written into Tag-it, exception error will occur even if it is succeeded to write. Because of that, it's necessary to compare the data (before writing) with the data (after writing).
		ISO18092 Communication between terminals	-		Software unsupported.
		ISO18092 Card mode	-		

Note:

1. Some of the commands remain unsupported.

Prior-verification before introduction of this system is required because cards deviating from ISO standard exist.

Item			Specifications	Remarks
SAM				
	Standard		ISO 7816 IC Card Standard	
	General Specification		SAM card of 1.8V/3V/5V are supported.	
SD Card Slot			Supporting SDHC/SDIO cards	
microSD Card Slot			Supporting SDHC card	
Extension Port				
USB				
	Connector Type		A	
	Connector Type		miniB	
	Host	Transfer Rate	Full speed (12Mbps) Low speed (1.5Mbps) High speed (480Mbps)	
		Bus Power Output	5V/500mA Max	
	Client	Transfer Rate	Full speed (12Mbps) High speed (480Mbps)	
Cradle Pin				
	Pin Layout		Refer to Figure 2.1.	
	Pin Assignment		Refer to Table 2.2.	
Camera				
	Effective Pixels		Approx. 5M Pixels (2592×1944 pixels)	
	Image Sensor		1/4.0 type, CMOS Image Sensor	
	Aperture		F2.8 ±5%	
	Focal Length		f = 3.4mm ±5%	
	Focus Distance		10cm to infinity	
LED Light			29.4072 Candela/Square meter	At steady lighting
Speaker			Alarm, etc.	
Microphone			Voice input	
Buzzer			Voice output	
Magnetic Sensor			Available	
Oparation mode switch			See Figure 2.2, Table 2.3	

Continue

The pin layout below shows when the terminal is viewed at the

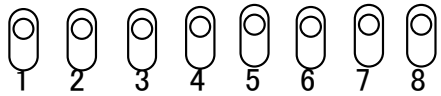


Figure 2.1 Pin layout

Table 2.2 Pin assignment table

Pin No.	Name	Function	Direction	Remarks
1	GND	GND	-	
2	USB_ID	To switch USB to Host or Client.	OUT	Output from Cradle
3	V CRADLE	Recharge/Power Supply to The Terminal.	-	
4	D+	USB D+	IN/OUT	
5	D-	USB D-	IN/OUT	
6	V CRADLE	Recharge/Power Supply to The Terminal.	-	
7	NONE			
8	GND	GND	-	

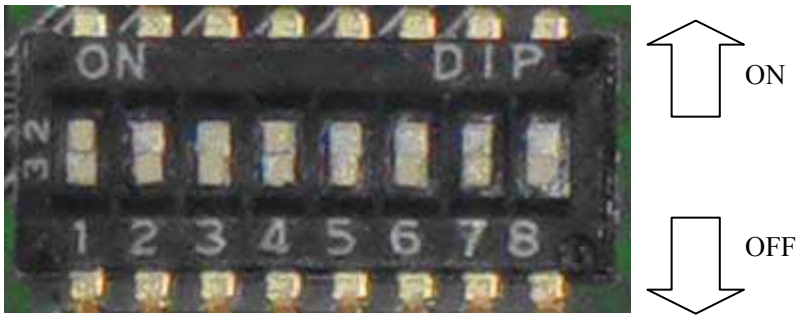


Figure 2.2 Switch layout

Table 2.3 Switch assignment table

No.	Initial switch state	Function	Remarks
1	ON		Setting change disabled
2	ON		Setting change disabled
3	ON		Setting change disabled
4	ON		Setting change disabled
5	ON		Setting change disabled
6	OFF		Setting change disabled
7	OFF	Operation mode switch	
8	OFF		Setting change disabled

Item		Specifications		Remarks
Power Supply				
	Main battery	Lithium Ion Polymer Rechargeable Battery		
	Backup battery	1 × Lithium Ion Secondary Battery		Built-in type
	Operating Time	Approx. 10 hours		Repeating below operation: Data communication: 1 min. Playback of video: 1 min. Reference to screen: 3 min. Stand-by (screen off): 10 min.
		WWAN standby: Approx. 150 hours		Normal temperature New battery pack Screen: OFF WWAN power: ON
		WWAN continuous communication: Approx. 2 hours		Normal temperature New battery pack Signal strength: good Screen: ON
	Back-up Time (Backup battery only)	RAM: 10 minutes RTC: Over 72 hours		At full-charge of backup battery under normal temperature.
	Back-up Time (Main + Backup battery)	RAM: 72 hours		After generation of battery-low alarm
	Main Battery Recharge Time	Approx. 6 hours		Normal temperature LAN /USB Cradle, AC adaptor and, Cradle-type Battery Charger supplies power to the terminal and recharge battery at same time.
	Recharge Specification	Refer to Table 2.4.		
	Backup battery Recharge Time	Approx. 6 hours		Time to full-charge of backup battery with main battery being set under normal temperature.
	Backup battery Specification			
	Nominal Capacity of Backup battery	510mAh		
	Recharge Control of Backup battery	Conditions	Availability of backup battery recharge	
		Powered by Cradle, AC adaptor.	Yes	
		Recharge by main battery. (The terminal power: ON)	Yes	
		Recharge by main battery. (The terminal power: OFF)	No	

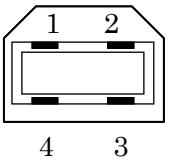
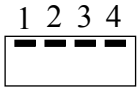
Table 2.4 Recharge Specification

Recharging method	Conditions for start of recharge	Behavior after completion of recharge
LAN/USB Cradle (HA-M62IO) Cradle-type Charger (HA-M30CHG)	Accessories in the left column are attached to the terminal.	Recharge will automatically start when the battery voltage made lower than certain level.

2.2 LAN/USB Cradle, HA-M62IO

The following table is for the basic specifications of LAN/USB Cradle, HA-M62IO.

Table 2.5

Item		Specifications	Remarks
USB Client			
	Standard	Conforming to USB Ver.2.0	
	Transfer Rate	Full Speed (12Mbps) High Speed (480Mbps)	
	Pin Layout	Refer to Figure 2.3.	
	Pin Assignment Table	Refer to Table 2.6.	
	Connector	 USB Connector: B Type	1. VBus 2. -Data (D) 3. +Data (D+) 4. GND
USB Host			
	Standard	Conforming to USB Ver.2.0	
	Transfer Rate	Full Speed (12Mbps) Low Speed (1.5Mbps) High Speed (480Mbps)	
	Bus Power Output	5V ±5%, 500mA Max.	
	Connector	 USB Connector A Type	1. VBus 2. –Data (D-) 3. +Data (D+) 4. GND
LAN			
	Communication Protocol	Conforming to IEEE802.3	
	Media Type	10base-T/100base-TX , auto-change	
AC Adaptor Input			
	Input Voltage	DC 12V ±5%	
	Current Consumption	DC12V 3.0A Max.	Power feed under transferring data
	Applicable AC Adaptor	AD-S36120A-N	

Continue

Recharge/Power Supply			
	Method	Hybrid method of contact and contactless type.	
	Contactless	Method: Inductive coupling type	
	Contact Zone	Output voltage: DC12V ±5%	
		Output Current: DC12V 2.0A.	
	Recharge Method	Constant Voltage with Current Limiter	By built-in recharge circuitry
	Recharge Time	Approx. 6 hours	By built-in recharge circuitry

The figure seen from the top.

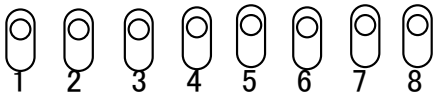


Figure 2.3 Pin layout

Table 2.6 Pin assignment table

Pin No.	Name	Function	Direction	Remarks
1	GND	GND	-	
2	USB_ID	To switch USB to Host or Client.	OUT	Output from Cradle
3	V CRADLE	Recharge/Power Supply to The Terminal.	-	
4	D+	USB D+	IN/OUT	
5	D-	USB D-	IN/OUT	
6	V CRADLE	Recharge/Power Supply to The Terminal.	-	
7	NONE			
8	GND	GND	-	

Dimensions and Weight

Table 2.7

Item	Specification	Remarks
Dimensions	Approx. 292(W) × 98.5(D) × 64(H) mm	
Weight (g)	Approx. 332 g	

2.3 Cradle-type Battery Charger, HA-M30CHG

The following table is for the basic specifications of Cradle-type Battery Charger, HA-M30CG.

Table 2.8

Item		Specifications	Remarks
AC Adaptor Input			
	Input Voltage	DC12V ±5%	
	Consumption Current	DC12V 3.0A Max.	Power feed under transferring data.
	Applicable AC Adaptor	AD-S36120A-N	
Recharge/Power Supply			
	Method	Hybrid method of contact and contactless type.	
	Contactless	Method: Inductive coupling type	
	Contact Zone	Output voltage: DC12V ±5%	
		Output Current: DC12V 2.0A.	
	Recharge Method	Constant Voltage with Current Limiter	By built-in recharge circuitry.
	Recharge Time	Approx. 6 hours	By built-in recharge circuitry.
Pin Layout		Refer to Figure 2.4.	
Pin Assignment Table		Refer to Table 2.9.	

The figure seen from the top.

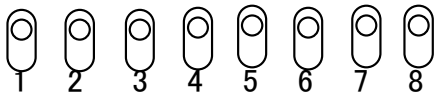


Figure 2.4 Pin layout

Table 2.9 Pin assignment table

Pin No.	Name	Function	Direction	Remarks
1	GND	GND	-	
2	NONE			
3	V CRADLE	Recharge/Power Supply to The Terminal.	-	
4	NONE			
5	NONE			
6	V CRADLE	Recharge/Power Supply to The Terminal.	-	
7	NONE			
8	GND	GND	-	

Dimensions and Weight

Table 2.10

Item	Specification	Remarks
Dimensions	Approx. 292(W) × 98.5(D) × 64(H) mm	
Weight (g)	Approx. 297 g	

2.4 Dual Battery Charger, HA-M32DCHG

The following table is for the basic specifications of Dual Battery Charger, HA-M32DCHG.

Table 2.11

Item		Specifications	Remarks
Charge			
	Charge Method	Current Voltage/Constant Current Method	With built-in current limiter.
	Recharge Time	For 1 battery pack only set: approx. 4 hours For 2 battery pack set: approx. 6 hours	Normal temperature Recharge 2 battery packs together.
Power Supply		AD-S90190C-N5	
Consumption Current		1 unit alone: approx. 1.10A 3 units connected together: approx. 3.0A	
Useable Temperature		Approx. 0°C to 40°C	
Useable Humidity		Approx. 30% to 80%	
Number of Connectable Units		3 units Max.	

Dimensions and Weight

Table 2.12

Item	Specification	Remarks
Dimensions	Approx. 196(W) × 60(D) × 55(H) mm	
Weight (g)	Approx. 242 g	Excluding a connecting plate.

2.5 In-vehicle Adaptor, HA-M37CAC

The following table is for the basic specifications of In-vehicle Adaptor, HA-M37CAC.

Table 2.13

Item	Specifications	Remarks
Rated Input Voltage	DC12V/24V	
Rated Output Voltage	DC7.5V	
Rated Output Current	3.5A	
Cigarette socket Standards	JIS D 5807	Red Cap Equipped
	DIN Standard socket(DIN ISO 4165)	Red Cap Unequipped

Dimensions and Weight

<Dimensions>

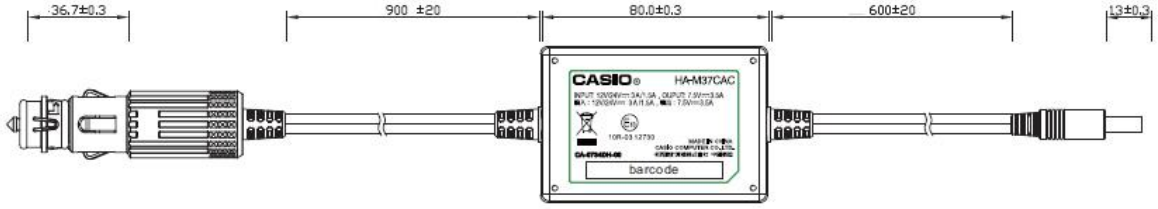


Figure 2.5

<Weight> 185 g

2.6 Rechargeable Battery Pack, HA-M20BAT

The following table is for the basic specifications of Rechargeable Battery Pack, HA-M20BAT.

Table 2.14

Item	Specifications	Remarks
Nominal Capacity	7000 mAh (25.9Wh)	
Nominal Voltage	3.7 V	

Dimensions and Weight

Table 2.15

Item	Specifications	Remarks
Dimensions	Approx. 135(W) × 94(D) × 7(H) mm	Excluding projections.
Weight (g)	Approx. 160 g	

2.7 AC Adaptors

The following table is for the basic specifications of AC Adaptors, AD-S90190C-N5/ AD-S36120A-N.

Table 2.16

Item	AC Adaptor for Dual Battery Charger (AD-S90190C-N5)	AC Adaptor for Cradle, The Terminal (AD-S36120A-N)
Rated Input Voltage	AC100V/240V	AC100V/240V
Rated Output Voltage	DC19V	DC12V
Rated Output Current	0 to 4740mA	0 to 3000mA
Frequency	47Hz to 63Hz	47Hz to 63Hz
Output Voltage Stability	18.5V to 19.95V	11.4V to 12.6V

3. Quality Specifications

This chapter describes environmental capabilities electrical specifications, mechanical specifications, reliabilities, applicable technical standards, etc., of V-T500/V-500 and Options for it,

3.1 Environmental Capabilities

3.1.1 V-T500/V-N500

The environmental capabilities of V-T500/V-N500 series (all models) is as follows.

Table 3.1

Item		Specifications	Conditions
Temperature			
	Operating	-20°C to 50°C	Recharge: 0°C to 40°C
	Non-operating	-20°C to 60°C	
Humidity (Moisture resistance)			
	Operating	10% to 90% RH	No condensation.
	Non-operating	5% to 90% RH	
Splash-proof/Dust-proof		Conforming to IEC60529 IP54	Covers closed. (Connector covers, etc.)
Storage with package			
	Temperature	-20°C to 60°C	
	Humidity (Moisture resistance)	5% to 90% RH	

3.1.2 LAN/USB Cradle, HA-M62IO

The environmental capabilities of LAN/USB Cradle, HA-M62IO is as follows.

Table 3.2

Item		Specifications	Conditions
Temperature			
	Operating	0°C to 40°C	
	Non-operating	-20°C to 60°C	
Humidity (Moisture resistance)			
	Operating	10% to 90% RH	No condensation.
	Non-operating	5% to 90% RH	No condensation.
Splash-proof/Dust-proof		Not applicable	
Storage with package			
	Temperature	-20°C to 60°C	
	Humidity (Moisture resistance)	10% to 90% RH	No condensation.

3.1.3 Cradle-type Battery Charger, HA-M30CHG

The environmental capabilities of Cradle-type Battery Charger, HA-M30CHG is as follows.

Table 3.3

Item		Specifications	Conditions
Temperature			
	Operating	0°C to 40°C	
	Non-operating	-20°C to 60°C	
Humidity (Moisture resistance)			
	Operating	10% to 90% RH	No condensation.
	Non-operating	5% to 90% RH	No condensation.
Splash-proof/Dust-proof		Not applicable	
Storage with package			
	Temperature	-20°C to 60°C	
	Humidity (Moisture resistance)	10% to 90% RH	No condensation.

3.1.4 Dual Battery Charger, HA-M32DCHG

The environmental capabilities of Dual Battery Charger, HA-M32CHG is as follows.

Table 3.4

Item		Specifications	Conditions
Temperature			
	Operating	0°C to 40°C	
	Non-operating	-20°C to 60°C	
Humidity (Moisture resistance)			
	Operating	30% to 80% RH	No condensation.
	Non-operating	10% to 90% RH	No condensation.
Splash-proof/Dust-proof		Not applicable	
Storage with package			
	Temperature	-20°C to 60°C	
	Humidity (Moisture resistance)	10% to 90% RH	No condensation.

3.1.5 In-vehicle Adaptor, HA-M37CAC

The environmental capabilities of In-vehicle adaptor, HA-M37CAC is as follows.

Table 3.5

Item		Specifications	Conditions
Temperature			
	Operating	0°C to 40°C	
	Non-operating	-20°C to 60°C	
Humidity (Moisture resistance)			
	Operating	20% to 80% RH	No condensation.
	Non-operating	10% to 90% RH	
Splash-proof/Dust-proof		Not Applicable	
Storage with package			
	Temperature	-20°C to 60°C	
	Humidity (Moisture resistance)	10% to 90% RH	

3.1.6 Rechargeable Battery Pack, HA-M20BAT

The environmental capabilities of Rechargeable Battery Pack, HA-M20BAT is as follows.

Table 3.6

Item		Specifications	Conditions
Temperature			
	Operating	Recharge: Conforms to battery charger. Discharge: Conforms to the terminal.	
	Non-operating	Conforms to the terminal.	
Humidity (Moisture resistance)			
	Operating	Recharge: Conforms to battery charger. Discharge: Conforms to the terminal.	
	Non-operating	Conforms to the terminal.	
Splash-proof/Dust-proof		Not Applicable	
Storage with package			
	Temperature	-25°C to 30°C	Within 1 year.
	Humidity (Moisture resistance)	90% or less RH	

3.1.7 AC Adaptor

The environmental capabilities of AC Adaptors, AD-S90190C-N5/AD-S36120A-N is as follows.

Table 3.7

Item		Specifications	Conditions
Temperature			
	Operating	0°C to 40°C	
	Non-operating	-20°C to 60°C	
Humidity (Moisture resistance)			
	Operating	20% to 80% RH	No condensation.
	Non-operating	10% to 90% RH	
Splash-proof/Dust-proof		Not Applicable	
Storage with package			
	Temperature	-20°C to 60°C	
	Humidity (Moisture resistance)	10% to 90% RH	

3.2 Electrical Specifications

3.2.1 V-T500/V-N500

The electrical specifications of V-T500/V-N500 series (all models) are as follows.

Table 3.8

Item		Specification	Remarks
Current Consumption		V-T500-GE: DC4.0A (Rechargeable Battery Pack use.) DC3.0A (AC Adaptor use.) V-T500-E: DC2.6A (Rechargeable Battery Pack use.) DC3.0A (AC Adaptor use.)	
Electrostatic Tolerance			
	Malfunction	Contact: ±4KV	150pF, 330Ω
		Air: ±8KV	
	Destruction	±12KV	

3.2.2 LAN/USB Cradle, HA-M62IO

The electrical specifications of LAN/USB Cradle, HA-M62IO is as follows.

Table 3.9

Item		Specification	Remarks
Input		DC12V ±5%	
Electrostatic Tolerance			
	Contact	±4KV	150pF, 330Ω
	Air	±8KV	
Momentary Power Failure		10msec or less	
Line Noise Tolerance			
	Malfunction	1000V	Pulse frequency: 5kHz Burst time cycle: 300msec Number of pulse: 75 Burst interval: 15msec

3.2.3 Cradle-type Battery Charger, HA-M30CHG

The electrical specifications of Cradle-type Battery Charger, HA-M30CHG is as follows.

Table 3.10

Item		Specification	Remarks
Input		DC12V ±5%	
Electrostatic Tolerance			
	Contact	±4KV	150pF, 330Ω
	Air	±8KV	
Momentary Power Failure		10msec or less	
Line Noise Tolerance			
	Malfunction	1000V	Pulse frequency: 5kHz Burst time cycle: 300msec Number of pulse: 75 Burst interval: 15msec

3.2.4 Dual Battery Charger, HA-M32DCHG

The electrical specifications of Dual Battery Charger, HA-M32DCHG is as follows.

Table 3.11

Item		Specification	Remarks
Current Consumption		Approx. 1.0A	Under charging with rechargeable battery pack installed.
		Approx. 5.0mA	Without battery
Input		DC12V ±5%	
Electrostatic Tolerance			
	Contact	±6KV	150pF, 330Ω
	Air	±8KV	
Line Noise Tolerance			
	Malfunction	1000V	Pulse frequency: 5kHz Burst time cycle: 300msec Number of pulse: 75 Burst interval: 15msec

3.2.5 In-vehicle Adaptor, HA-M37CAC

The electrical specifications of In-vehicle Adaptor, HA-M37CAC is as follows.

Table 3.12

Item	Specification	Remarks
Electrostatic Discharge Immunity Type Test	Contact: ±4KV Air: ±8KV	It follows the test method of IEC61000-4-2.
Radiation Field Immunity Type Test	Frequency: 80MHz to 1000MHz Field Strength: 3V/m	It follows the test method of IEC61000-4-4.
Burst Wave Noise Immunity Type Test	AC input: ±1KV	It follows the test method of IEC61000-4-4.
Serge Noise Immunity Type Test	L1-L2: ±1KV L1/L2-PE: ±2KV	It follows the test method of IEC61000-4-5.

3.2.6 AC Adaptors, AD-S90190C-N5/AD-S36120A-N

The electrical specifications of AC Adaptors, AD-S90190C-N5/AD-S36120A-N is as follows.

Table 3.13

Item	Specification	Remarks
Electrostatic Discharge Immunity Type Test	Contact: ±4KV Air: ±8KV	It follows the test method of IEC61000-4-2.
Radiation Field Immunity Type Test	Frequency: 80MHz to 1000MHz Field Strength: 3V/m	It follows the test method of IEC61000-4-4.
Burst Wave Noise Immunity Type Test	AC input: ±1KV	It follows the test method of IEC61000-4-4.
Serge Noise Immunity Type Test	L1-L2: ±1KV L1/L2-PE: ±2KV	It follows the test method of IEC61000-4-5.

3.3 Mechanical Specifications

3.3.1 V-T500/V-N500

The mechanical specifications (drop/shock and vibration resistance) of V-T500/V-N500 series (all models) are as follows.

Table 3.13

Item			Specifications	Conditions
V-T500/V-N500				
	Drop/Shock Strength		V-T500-E unit : 1.0m V-N500E unit : 1.0m (with system case or screen cover)	Drop of 2 cycles for 6 surfaces, 1 corner to concrete the floor. (Test results only, not for guarantee purpose.) Drop/shock strength for operation of SD card being inserted is up to 30cm. If dropped from a height exceeding 30cm, the terminal may fail to recognize SD card. In such case, remove and reinsert it.
	Vibration Resistance		3G	5Hz to 200Hz, 2 hours for X-Y direction and 4 hours for Z direction
Packing Box				
	Drop/Shock Strength			
		Individual	70cm	Drop of 1 cycle for 6 surfaces, 1 corner, 3 edges.
		Assembly	70cm	

3.3.2 LAN/USB Cradle, HA-M62IO

The mechanical specifications (drop/shock and vibration resistance) of LAN/USB Cradle, HA-M62IO is as follows.

Table 3.14

Item			Specifications	Conditions
HA-M62IO				
	Drop/Shock Strength		75cm	Drop of 1 cycle for 6 surfaces to concrete floor.
	Vibration Resistance		1.5G or less	10Hz to 55Hz, 30 minutes, reciprocative in X/Y/Z directions Power on, idle
Packing Box				
	Drop/Shock Strength			
		Individual	70cm or less	Drop of 1 cycle for 6 surfaces, 1 corner, 3 edges.
		Assembly	50cm or less	
	Vibration Resistance		1.5G or less	10Hz to 55Hz, 30 minutes, reciprocative in X/Y/Z directions.

3.3.3 Cradle-type Battery Charge, HA-M30CHG

The mechanical specifications (drop/shock and vibration resistance) of Cradle-type Battery Charger, HA-M30CHG is as follows.

Table 3.15

Item			Specifications	Conditions
HA-M30CHG				
	Drop/Shock Strength		75cm	Drop of 1 cycle for 6 surfaces to concrete floor.
	Vibration Resistance		1.5G or less	10Hz to 55Hz, 30 minutes, reciprocative in X/Y/Z directions Power on, idle
Packing Box				
	Drop/Shock Strength			
		Individual	70cm or less	Drop of 1 cycle for 6 surfaces, 1 corner, 3 edges.
		Assembly	50cm or less	
	Vibration Resistance		1.5G or less	10Hz to 55Hz, 30 minutes, reciprocative in X/Y/Z directions.

3.3.4 Dual Battery Charger, HA-M32DCHG

The mechanical specifications (drop/shock and vibration resistance) of Dual Battery Charger, HA-M32CHG is as follows.

Table 3.16

Item			Specifications	Conditions
HA-M32CHG				
	Drop/Shock Strength		70cm	Drop of 1 cycle for 6 surfaces, 4 edges to concrete floor.
	Vibration Resistance		1.5G or less	10 to 55Hz, 30minutes, reciprocative in X/Y/Z directions Power off
Packing Box				
	Drop/Shock Strength			
		Individual	70cm or less	Drop of 1 cycle for 6 surfaces, 1 corner, 3 edges.
		Assembly	60cm or less	
	Vibration Resistance		1.5G or less	10 to 55Hz, 30minutes, reciprocative in X/Y/Z directions.

3.3.5 In-vehicle Adaptor, HA-M37CAC

The mechanical specifications (drop/shock and vibration resistance) of In-vehicle Adaptor, HA-M37CAC is as follows.

Table 3.17

Item			Specifications	Conditions
HA-M37CAC				
	Drop/Shock Strength		70cm	Drop of 3 cycles for 6 surfaces to plastic tiled floor.
	Vibration Resistance		0.5G or less	10Hz to 100Hz, 10 minutes, reciprocative in X/Y/Z directions.
Packing Box				
	Drop/Shock Strength			
		Individual	70cm or less	Drop of 1 cycle for 6 surfaces, 1 corner, 3 edges to concrete floor.
		Assembly	70cm or less	

3.3.6 Rechargeable Battery Pack, HA-M20BAT

The mechanical specifications (drop/shock and vibration resistance) of Rechargeable Battery Pack, HA-M20BAT is as follows.

Table 3.18

Item			Specifications	Conditions
HA-M20BAT				
	Drop/Shock Strength		100cm	Drop of 1 each time for 6 surfaces, 4 edges to plastic tiled floor.
	Vibration Resistance		1.5G or less	10Hz to 55Hz, 30 minutes, reciprocative in X/Y/Z directions.
Packing Box				
	Drop/Shock Strength			
		Individual	70cm or less	Drop of 1 cycle for 6 surfaces, 1 corner, 3 edges to concrete floor.
		Assembly	70cm or less	

3.3.7 AC Adaptor

The mechanical specifications (drop/shock and vibration resistance) of AC Adaptors, AD-S90190C-H5/AD-S36120A-H are as follows.

Table 3.19

Item			Specifications	Conditions
Drop/Shock Strength			70cm	Drop of 3 cycles for 6 surfaces to plastic tiled floor.
Vibration Resistance			0.5G or less	10Hz to 100Hz, 10minutes, reciprocative in X/Y/Z directions.
Packing Box				
	Drop/Shock Strength			
		Individual	70cm or less	Drop of 1 cycle for 6 surfaces, 1 corner, 3 edges to concrete floor.
		Assembly	70cm or less	

3.4 Compliance

3.4.1 V-T500/V-N500

The following table shows applicable Standards, Directives, and Requirements for V-500/V-N500 series.

Table 3.20

Area	Category			Standard /Requirement	V-T500/V-N500 E
World	Safety Standard			IEC60950-1 2nd Edition	Yes
	Laser/LED			IEC60825-1	-
	Dust-proof/Splash- proof			IEC60529 IP54	Yes
	In-vehicle Std. E Mark			ECE Reg.10	-
	Bluetooth Logo Authentication		Class 1	PRD2.0	-
			Class 2	PRD2.0	Yes
Europe	LVD Directive, R&TTE Directive	Safety Standard	Product	EN60950-1	Yes
		Safety Standard	Laser/LED	EN60825-1	-
	ErP Directive	Lot6	Standby and off mode	Lot6 Step 2	Yes
		Lot7	External power supplies	Lot7 Step 2	-
	WAN Protocol (2G/3G LTE)			GCF-CC V3.21.0	-
	EMC Directive	EMS		EN55024	-
		EMI		EN55022	-
				EN61000-3-2	-
				EN61000-3-3	-
		In-vehicle standard		ISO7637	-
	R&TTE Directive	WLAN/BT	ERM	EN 300 328	Yes
				EN 301 893	Yes
			SAR	EN 62311	Yes
			EMC	EN 301 489-17	Yes
		GSM (2G)	ERM	EN 301 511	-
			SAR	EN 62311	-
			EMC	EN 301 489-7	-
		WCDMA (3G)	ERM	EN 301 908-2	-
			SAR	EN 62311	-
			EMC	EN 301 489-24	-
		RF-ID	ERM	EN 300330-2	Yes
			SAR	EN 50364	Yes
			EMC	EN 301489-3	Yes
		Wireless Power Transmission (WPT)	ERM	EN 300330-2	Yes
			EMF	EN 62311	Yes
			EMC	EN 301489-3	Yes
		GPS	EMC	EN 301489-19	Yes

3.4.2 LAN/USB Cradle, HA-M62IO

The following table shows applicable Standards, Directives, and Requirements for LAN/USB Cradle, HA-M62IO.

Table 3.21

Area	Category			Standard/Requirement	Remarks
World	Safety Standard			IEC60950-1	Yes
	In-vehicle Std.	E Mark		ECE Reg.10	-
Europe	R&TTE Directive	Safety Standard		EN60950-1	Yes
		Wireless Power Transmission (WPT)	ERM	EN 300330-2	Yes
			EMF	EN 62311	Yes
			EMC	EN 301489-3	Yes
	Energy efficiency	Erp Directive		Lot6 Step2	Yes
	EMC Directive	EMS		EN55024	-
		EMI		EN55022	-
				EN61000-3-2	-
				EN61000-3-3	-
	Vehicles Directive	EMI		ECE Reg.10	-

3.4.3 Cradle-type Battery Charger, HA-M30CHG

The following table shows applicable Standards, Directives, and Requirements for Cradle-type-Battery Charger, HA-M30CHG.

Table 3.22

Area	Category			Standard/Requirement	Remarks
World	Safety Standard			IEC60950-1	Yes
	In-vehicle Std.	E Mark		ECE Reg.10	-
Europe	R&TTE Directive	Safety Standard		EN60950-1	Yes
		Wireless Power Transmission (WPT)	ERM	EN 300330-2	Yes
			EMF	EN 62311	Yes
			EMC	EN 301489-3	Yes
	Energy efficiency	Erp Directive		Lot6 Step2	Yes
	EMC Directive	EMS		EN55024	-
		EMI		EN55022	-
				EN61000-3-2	-
				EN61000-3-3	-
	Vehicles Directive	EMI		ECE Reg.10	-

3.4.4 Dual Battery Charger, HA-M32DCHG

The following table shows applicable Standards, Directives, and Requirements for Dual Battery Charger, HA-M32CHG.

Table 3.23

Area	Category			Standard/Requirement	Remarks
World	Safety Standard			IEC60950-1	-
	In-vehicle Std.	E Mark		ECE Reg.10	-
Europe	R&TTE Directive	Safety Standard		EN60950-1	-
		Wireless Power Transmission (WPT)	ERM	EN 300330-2	-
			EMF	EN 62311	-
			EMC	EN 301489-3	-
	Energy efficiency	Erp Directive		Lot6 Step2	-
	EMC Directive	EMS		EN55024	Yes
		EMI		EN55022	Yes
				EN61000-3-2	Yes
				EN61000-3-3	Yes
	Vehicles Directive	EMI		ECE Reg.10	-

3.4.5 Rechargeable Battery Pack, HA-M20BAT

The following table shows applicable Standards, Directives, and Requirements for Rechargeable Battery Pack, HA-M20BAT.

Table 3.24

Area	Category				Standard/Requirement	Remarks
World	Safety Standard				IEC60950-1	Yes
	In-vehicle Std.	E Mark			ECE Reg.10	-
America	EMI	FCC			CFR 47 Part 15 Subpart B	-
	Safety	UL	In-vehicle unit		UL 2089	-
			Battery pack		UL 2054	Yes
			Information systems		UL 60950-1	Yes
Europe	R&TTE Directive	Safety Standard			EN60950-1	-
		Wireless Power Transmission (WPT)		ERM	EN 300330-2	-
				EMF	EN 62311	-
				EMC	EN 301489-3	-
	Energy efficiency	Erp Directive			Lot6 Step2	-
	EMC Directive	EMS			EN55024	Yes
		EMI			EN55022	Yes
					EN61000-3-2	Yes
					EN61000-3-3	Yes
	LVE Directive	Safety			EN60950-1	-
	Vehicles Directive	EMI			ECE Reg.10	-

3.1 Performance Reference

3.1.1 Handling Contactless Smart Card

This chapter explains about card accessing area's name and detail, usage of scanning direction and precautions.

About accessing area's name and detail

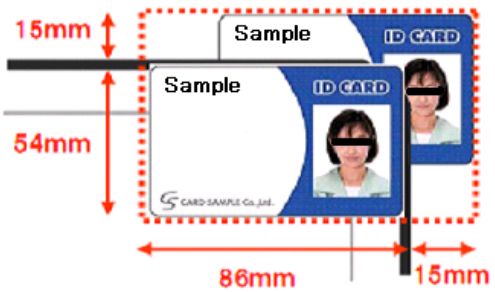
Table 3.25 NFC's Access Block and Areas

Block/Area	Description	Remarks
ID block	Reads individual ID of contactless smart card.	
Non-security area Private area	Data area which do not require password authentication or communication packet encryption to carry out read or write data.	
Security area Common area	Data area which requires password authentication or communication packet encryption to carry out read or write data.	Configuration of secured system with security module or security server may be required.
Common area	Memory area for public service of specific company (Felica only)	
Private area	Memory area which can be used as free for card publisher(Felica only)	

About scanning range

Front face: Type A, Type B, FeliCa Rear face: Type A, Type B, FeliCa, ISO15693 Tag

Card



Range of reading smart card.

Figure 3.1

About scanning angle

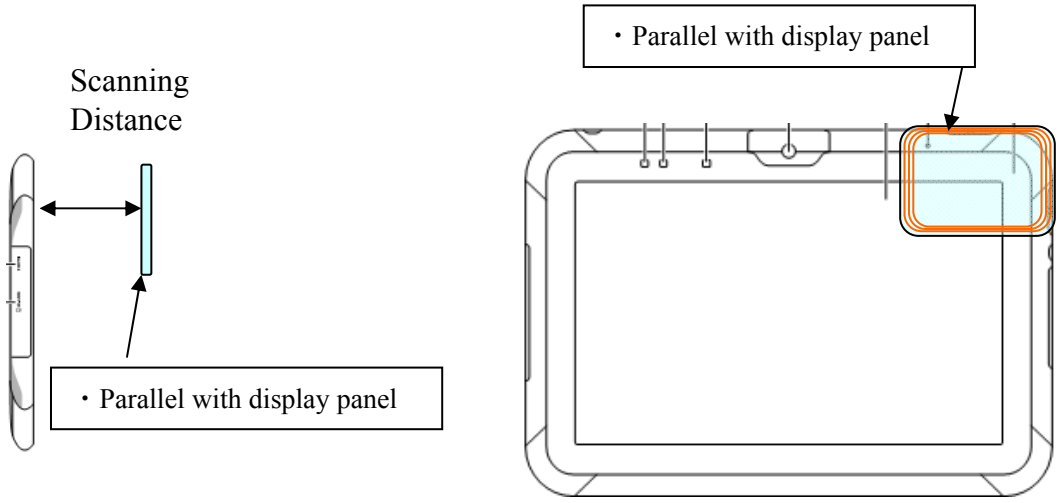


Figure 3.2

Scanning condition

Contactless Smart Card (ISO14443 Type A/B, Felica)

Table 3.26 Condition

Minimum operating magnetic filed	1.5A/m over
Direction	Parallel direction with display panel
Angle	Parallel with display panel
Range	See Figure 3.3, Figure 3.4
Distance	0mm (Contact with case)
Style	ISO7810(JISX6301) standard card's style

Range of Magnetic field strength is 1.5A/m over. reference PICC

Front

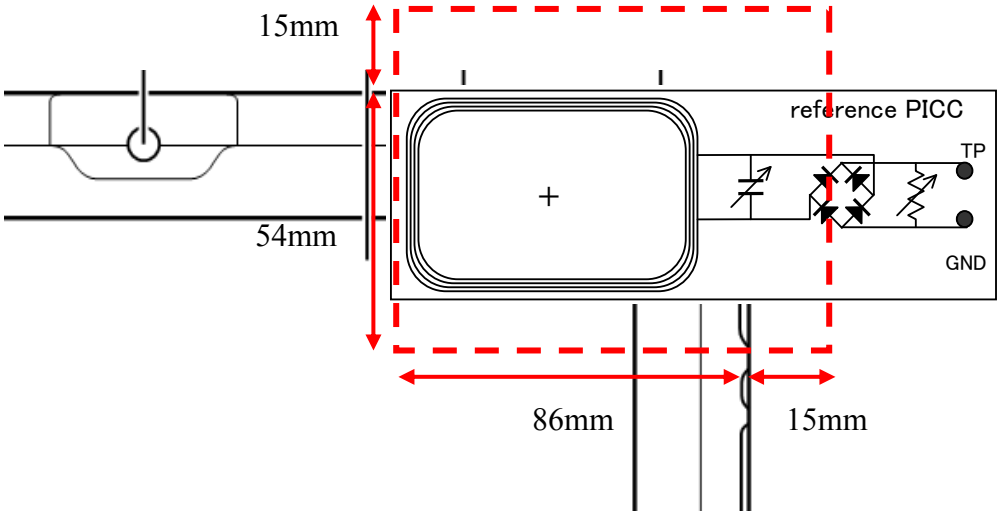


Figure 3.3

Rear

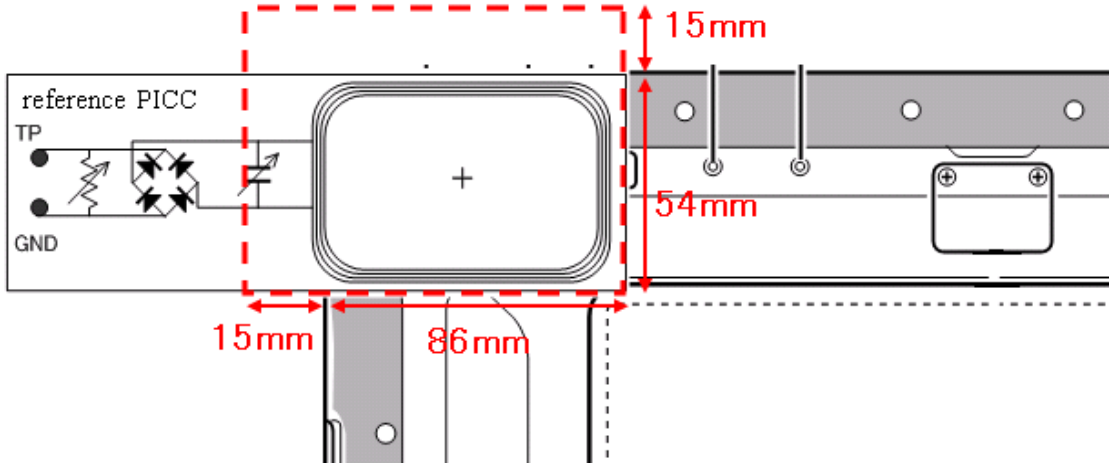


Figure 3.4

RFID tag (ISO15693)

Table 3.27 Condition

Minimum operating magnetic filed	1.5A/m over
Direction	Parallel direction with dislay panel
Angle	Parallel with display panel
Range	See Figure 3.4
Distance	0mm (Contact with case) – 50mm
Style	ISO7810(JISX6301) standard card's style

Rear

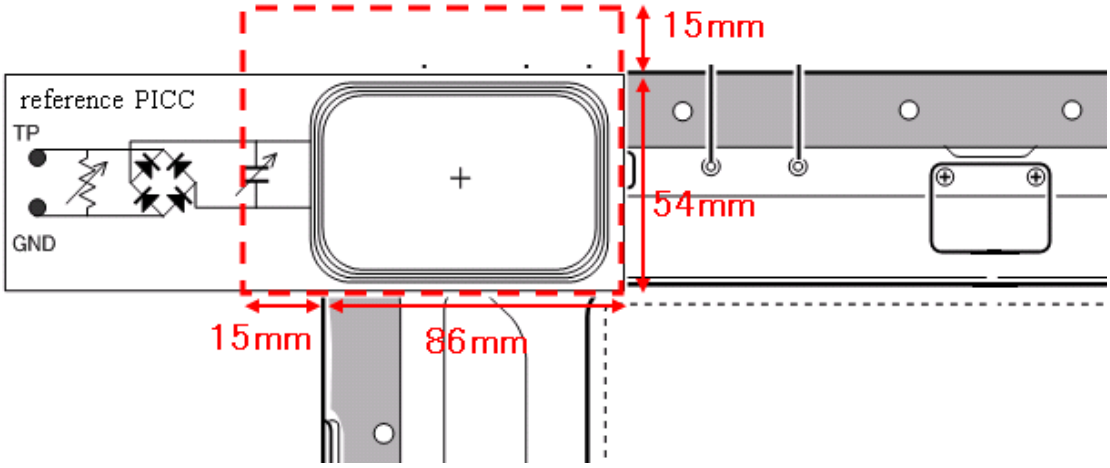


Figure 3.5

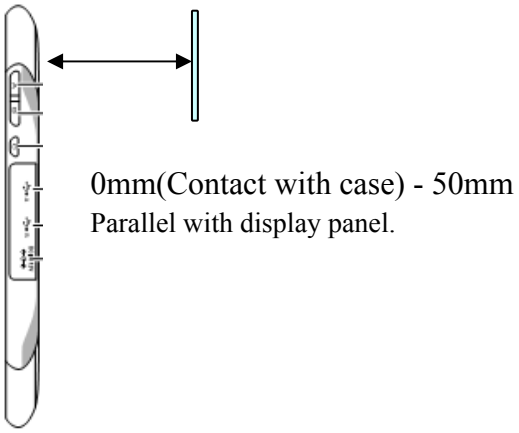


Figure 3.6

Note:

There is possibility to change scanning range or can not scan by RFID tag/ Contactless Smart Card antenna style or power consumption.

Especially, there is a case which ISO14443 TypeB card such as IC driver license need 1.5A/m over magnetic field strength.

Antenna sensitivity most strength location is center of scanner filter.

About operating magnetic field

Contactless Smart Card Standard ISO 14443 and Felica, RFID tag Standard ISO 15693 is defined magnetic field strength (radio wave strength) for communicating with card and tag, and this is standard of communication distance with card and tag.
But magnetic field strength described in this section is imaged 85 x 54mm (4 times scroll antenna) card tag, therefore communication distance will be changed by style of tag and number of scroll antenna. (ex. If tag style will be small, antenna sensitivity will be bad, therefore communication distance is not same.)
This description can not be guaranteed all cards and tags communication, therefore please execute enough operation test before installation.

Scanning distance (Reference)

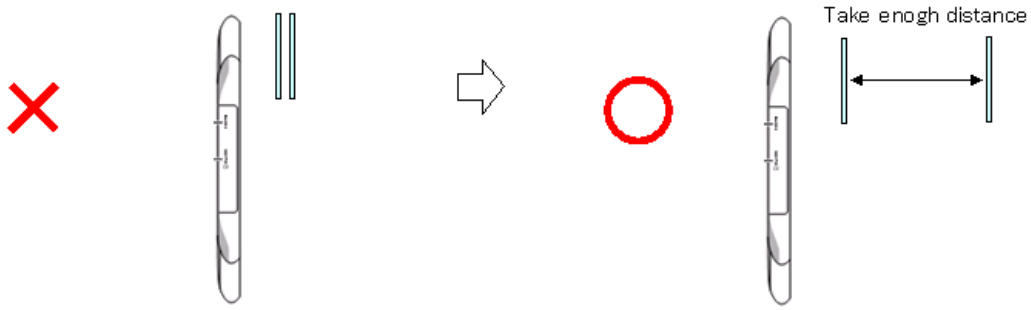
Scanning distance of RDIF tag / Contactless Smart Card will be different with antenna style or number of scroll or IC chip type.
The following reference is information of scanning distance at each style of RFID tag / Contactless Smart Card. This is just reference value, therefore please execute enough operation test before installation.

Scanning Distance(reference) 0mm 50㎜		Standard	Style	Remarks
	0mm	ISO1443 Type A	86×54mm Card	
	0mm	ISO1443 Type B	86×54mm Card	
	0mm	FeliCa	86×54mm Card	
◄——————►	0 - 40mm	ISO15693	86×54mm Label type	
◄———►	0 - 15mm	ISO15693	50×18mm Label type	
◄———►	0 - 20mm	ISO15693	18×18mm Label type	
◄———►	0 - 25mm	ISO15693	□21mm Resin mold, coin type	
◄———►	0 - 20mm	ISO15693	42×20mm Resin mold, coin type	
◄———►	0 - 20mm	ISO15693	58×48mm Metal support, Label type	Case of put on the metal object in direct.

Note:
ISO14443 Type A, Type B, FeliCa areferencesof front and rear side.
ISO15693 is reference of rear side.

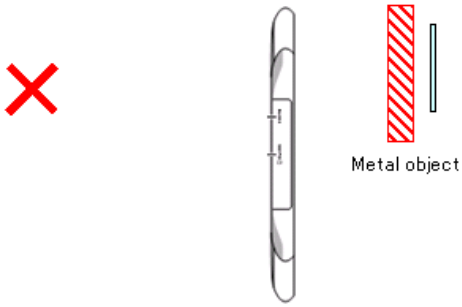
Note of operation

In the following case, there is possibility to can not read and write of RFID tag / Contactless Smart Card.
*Several pieces RFID tag / Contactless Smart Card are piled up.



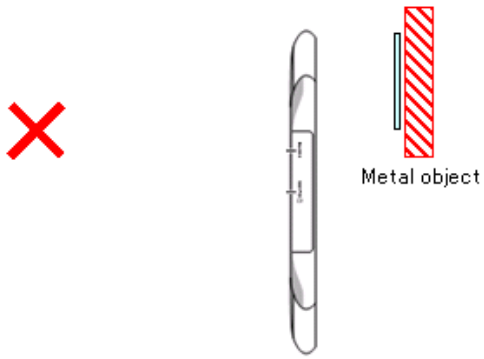
- Do not locate nearby with not scan RFID tag / Contact Smart Card .
- If several cards is located in same pass case inside, you should take out necessary card from pass case.
- Take enough distance between RFID tags / Contactless Smard Cards.

*Exist metal material between antenna and RFID tag / Contact Smart Card



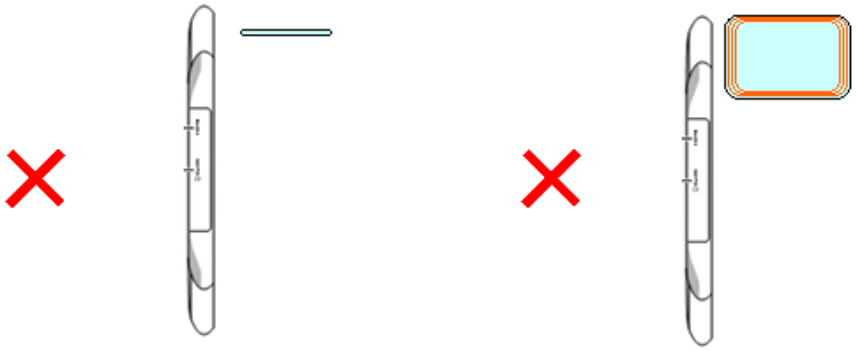
- If you place Contact Smart Card in wallet, you should take out necessary card from wallet.
- If RFID tag is located in metal case, you should take out RFID tag from metal case then execute scan operation.

*Put on RFID tag / Contactless Smart Card to metal object.

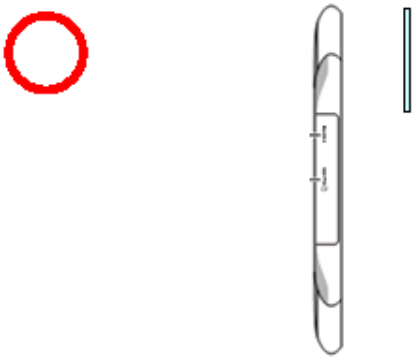


- Keep about 30mm distance between RFID tag / Contact Smart Card and metal object.
- Use metal support tag.

*Do not locate RFID tag / Contact Smart Card to antenna face as vertical position.



- Closer RFID tag / Contact Smart Card to antenna face as parallel position.



Note of usage

1. If you access to security area of card, there is necessary case which configure secure system by security module or security server.

4. Precautions

Please read the instruction manual carefully and follow its contents.

4.1 Precautions for Handling and Operating V-T500/V-N500

4.1.1 About Recharging, Supplying Power, and Battery

- The backup battery is a secondary battery. Please pay attention not to replace the main rechargeable battery pack if the backup battery is not fully charged. When the main battery is removed from the terminal unit with the exhausted backup battery, it will cause loss or change of data. The backup battery, recharged longer than 30 minutes, can backup the RAM memory for about 10 minutes.
- The rechargeable battery would lower its output voltage due to shipping inspection and natural discharge while kept in stock. Please recharge the battery beforehand.
- Rechargeable battery will shorten its life by repeated charge/discharge cycles. Please replace the rechargeable battery pack with new one when the continuous operating time after recharge becomes extremely short.
- Please recharge the main battery in a temperature range of approximately 0 to 40°C. Otherwise, the recharge protector will be activated to shut down the recharge operation.
- After repeating the charge/discharge cycles for some time, the rechargeable battery will swell. Please replace it with new one if you find such swell.

4.1.2 Others

- While talking over the terminal for a long time, the terminal will become warm, but this is not abnormal.
- When inserting SIM/SAM/SD card to the terminal, please make sure to insert it with the correct direction. If forcibly or wrongly inserted, it will cause damage to the card. When the card is incorrectly inserted, you cannot install the rechargeable battery pack into terminal. Remove the card once and reinsert it with correct direction if such case happened.
- When you will use W CDMA/GSM telecommunication services, you will need to have a contract with a service-provider to take service of it. The available services are determined by the service-provider whom you will connect. For the detail of available services, please consult with the network service-provider.
- When the GPS function is used at first time or after a long unused period, it may take time for verifying its position.
- In such case, firstly select a location where communication failures will not occur by nearby obstacles, idle the terminal for 15 minutes or more after turning the power on then start the GPS operation. The GPS module uses signals transmitted by the satellite under control of the US Government. The accuracy of the positioning information is affected by operating conditions of the satellite. In addition, the terminal may fail to receive signals inside buildings or tunnels because the signal is transmitted from the satellite. For in-vehicle use, select a location beforehand where the receiving sensitivity is favorable.
- Do not give the terminal strong shock including drop while using it in the rainy condition. The unit may lose the splash-proof capability.
- If undesinated USB cable is used, it may be difficult to keep the strength for prying.

- System case does not support splashproof specification. wipe it with soft and dry clothes if system case gets wet.
- Magnetic parts are used in system case. Keep off the magnetism and don't put magnetism in system case.
- Don't use the volatile medichine, like thinner/benzine/cosmetics, to clean the terminal unit.
- Wipe the terminal unit with soft and dry clothes if it gets dirty. It may get scratches if it's wiped strongly with clothes.
- Clean the power terminal and charge terminal with dry cotton swab occasionally. it may cause for poor contact if it gets dirty.
- Pay attention at medichine. Because resin case and cover may gets damage/discolored if medichine (like thinner/gasoline/kerosene/solvents/fats and oils) or cream/glue/pint/cosmetic including such a medichine is used.

4.2 Storage

- For storage of the terminal for a long time, be sure to remove the battery.
- Avoid keeping the terminal in a place becoming high temperatures such as in a vehicle.

4.3 Safety Precautions

- Please follow the Operation Manual.

5. Maintenance

- The components and operational items of the temperature need neither periodical replacement nor check.

6. Installation

- Please install and operate the temperature keeping precautions strictly.
- For configuring W-LAN wireless network, please set up it referring to Wireless LAN Setup Procedures with checking the suitable communication conditions including the location of the access point.